

## **Title: All That Glitters...**

### **Brief Overview:**

This lesson focuses on the use of patterns to solve problems geared towards creating, then producing a usable product - a piece of jewelry. Students will practice copying, describing, extending, and creating patterns. They will see patterns, make predictions, and organize data to find solutions. Students will write to inform and persuade.

### **Link to Standards:**

- **Problem Solving** Students will demonstrate their understanding and ability to solve problems involving patterns and functions.
- **Communications** Students will demonstrate their ability to communicate mathematically. Students will read, write about, and discuss relationships observed in patterns.
- **Reasoning** Students will demonstrate their ability to reason mathematically by gathering, organizing, and displaying data; by making predictions, and by using models to illustrate their thinking.
- **Connections** Students will demonstrate their ability to connect their knowledge of patterns and functions to a real-life situation.
- **Patterns and Functions** Students will demonstrate their ability to recognize numeric and geometric relationships. They will generalize a relationship from data.

### **Grade/Level:**

Grades 3 and 4 special and general education students

### **Duration/Length:**

This unit should take a minimum of five consecutive days.

### **Prerequisite Knowledge:**

- Students should be able to copy/reproduce a visual representation.
- Students should be able to work cooperatively.
- Students should have knowledge of the extended writing process

### **Objectives:**

- To identify and label pattern sequences
- To use models to design and construct patterns to meet given criteria
- To record and analyze data to discover patterns
- To construct and / or complete a table
- To write a descriptive paragraph
- To use a rubric to evaluate students' writing
- To write a persuasive letter
- To produce a usable product of patterns

## Materials/Equipment

- Overhead projector
- A movement recording or song
- Unifix cubes
- Pattern blocks
- Crayons
- Tape recorder
- Transparencies and pens
- Geoboards and bands
- Student Resource Sheets
- Variety of small items for making patterns if commercial items are not available

## Development/Procedures:

### Activity 1: "Let Your Body Move"

Students will imitate/copy patterns demonstrated by teacher in form of aerobic dance.

- Clear area to allow for movement.
- Lead class in an aerobic dance routine; demonstrate a variety of patterns.
- Observe students as they imitate your movements.
- Have students recall several of the patterns or steps.
- Have students demonstrate or explain several of the patterns or steps; i.e., stand squat, stand squat, etc.
- Allow time for several students to contribute at least one of the dance patterns or steps.
- Pair students for brainstorming to generate a list of other movements which show patterns, i.e., hand jives, line dances, drill team exercises, marching bands, etc.
- List students' responses and emphasize that patterns are a part of real life.

### Activity 2: "Follow Me"

Students will copy, describe, and extend patterns.

#### A.

- Give students paper, manipulatives, crayons, or markers.
- Tell students that patterns are shown in a variety of forms.
- Draw a pattern on the overhead, chalkboard or chart paper (large enough for class to observe).
- Have students describe what they see, encouraging them to make distinctions or identify the parts of the pattern.
- Introduce or review vocabulary: **term, core.**
- Question students as to how to continue the pattern.
- Have students continue the pattern three more times (repeat the core).
- Ask , "In what other ways can you represent what you see? Think about the aerobic routine. How can this pattern be used to represent a pattern you danced?" (Student might respond, "Arms out, arms bent, arms out, arms bent.")

#### B.

- Make a pattern using pattern blocks or other concrete materials.
- Have students describe what they see.
- Encourage use of math vocabulary - core, term.
- Have students copy and continue the pattern at least three more times.
- Ask students to recall again the aerobic patterns. Have students explain another way for this pattern to be represented.

**(Teacher will determine the number of examples needed for demonstration.)**

**C.**

- Make a number pattern (ex. 123321123321123321 )
- Have student copy, describe, then continue the pattern.
- Follow same procedures as for previous examples.

**Activity 3: "Do Your Thing!"**

Students will build patterns from a verbal or written description, then create their own.

**A.**

- Pair the students for this activity.
- Give a scenario that relates to real life. For example, "Now you will be given the opportunity to build patterns. Just as an architect needs blueprints to build a house, a designer needs a plan to make a suit, and Mom needs a recipe to bake a cake, you will be given directions for building your patterns.
- Give each pair of students a set of direction cards for making patterns (**Student Resource Sheet #1**)
- Allow enough time for students to complete at least 2 of the patterns.
- Survey the groups as students work in order to assess their understanding of the construction of patterns.
- Permit students to share their work. Each group or representative will choose one pattern to reproduce and describe. Encourage students to use appropriate mathematical terms as they describe their patterns.

**B.**

Students will use **Student Resource #2 and #3** along with manipulatives and materials for recording to complete this activity. Students will create patterns.

- Review with students the description of a pattern and its components. They will work individually to create patterns.
- Pair students when they have completed Student Resource #2. Students will exchange papers and complete Student Resource #3 (Peer Response).
- Discuss responses to peer response questions.
- Display students' patterns. Discuss similarities and differences. Categorize patterns. Ask questions such as, "Who has a pattern that repeats the same way? Is there a pattern that repeats differently or has a different core? Describe what you see. Can you state a rule?"

**Activity 4:**

The purpose of this activity is to have students move from a concrete and pictorial construction of patterns to a verbal and written communication of the patterns they recognize. Students will record number patterns in tables and use them to help see relationships in order to form a rule. The goal is to help students see the relationship between the terms of the sequence and the pattern.

- Present a scenario. Example. Your neighborhood is being wired for cable. The poles have already been placed, but all the cable lines have not been run. There is only one worker whose truck is not equipped to carry all the cable lines at once. He knows that he will only be able to run cable between 10 poles. He used one cable line to run between two poles, two cable lines to run between three poles, and three cable lines to run between four poles. How many lines of cable would he have to put on the truck ?
- Generate responses by letting students brainstorm with a neighbor.
- Accept and record all predictions.

- Ask questions:  
"What information is given that you would need to solve this problem? How can we organize this information so that it would be easier to work with?"
- Help students to move in the direction of the desired response of putting the information in a chart or table.
- Make a table. Record information from the problem.
- Give students time to discuss with a neighbor observations.
- Ask questions based on information from the table. Ex. "Was any cable used for one pole? How many cable wires were used between two poles? 3 poles? How many do you think will be used for 4 poles?"
- Take out the geoboards. (It would be great if you have one for the overhead!)
- Use pegs of board to represent poles and geobands to represent cable wires. Illustrate, together the first three entries on table.
- Have students complete the next three entries. Ask, "What do you see happening to the numbers?"
- Give ample time for responses. Additional examples may be needed if students are not able to describe a pattern. Your aim is for students to see a pattern or relationship between the numbers.
- Pick out pairs of numbers from the table. Have students explain the relationship between the two. Ask, "How do we get from \_\_\_\_ to \_\_\_\_? Give enough examples of pairs of numbers until students can tell you the rule for getting from one number to the next.
- Refer back to problem. How many pieces of cable would be needed for 12 poles? 15 poles? etc.
- Distribute **Student Resource #4**.

#### **Activity 5: "All That Glitters..."**

Now, students will use their knowledge of patterns and functions as they create and decorate a piece of jewelry.

- Give the students **Student Resource #5**.

#### **Activity 6:**

Finally, students will design and make jewelry to display and sell at the school fair. Read the following to the students:

All committee work was completed and their findings submitted. It was decided that students would make necklaces or bracelets to sell at the school fair. Using the information from the various committees, design and make your own piece of jewelry. Remember, your jewelry must show a repeated pattern.

#### **Activity 7:**

Students will create patterns. Read the following to the students:

A booth will be set up to display your jewelry. Design a poster of patterns to display in your booth.

**Performance Assessment:**

Teacher Resource #1 contains rubrics for assessing student performance on problems #1, #2, and #3 of Student Resource #5. In addition, give the students the following performance assessment question:

Now that you have completed the designing the jewelry that was submitted by the committee for your consideration, what is your recommendation to the committee? USE A MEMO FORM to inform the committee of your results.

**Extension/Follow-up:**

Students may do the following:

- Design a wall mural or hanging for the classroom which is made up of patterns.
- Find number patterns on the hundreds chart.
- Design wrapping paper of patterns.
- Make a pattern box: Students show an example of a pattern they've identified from their environment by reproducing it on a file card and writing the interpretation on the back; this they place in the pattern box.

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**All That Glitters...  
Pattern Direction Cards**

**Student Resource #1**

**Direction Set #1 (cut out and clip together with a paper clip):**

Use six Unifix cubes of three colors.	Two cubes must be blue.
No two blue cubes are next to each other.	The pattern must begin and end with the same color.

**Direction Set #2 (cut out and clip together with a paper clip):**

Use five pattern blocks of three colors.	One block must be red.
No red block is next to a green block.	No two blocks of the same color are together.

**Create Your Own Patterns**

Use objects to make you pattern. Reproduce it here!

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Make a number pattern.

**Peer Response**

You have had many activities working with patterns. You have created a pattern of your own. Have your partner look at your pattern. Ask your partner the following questions and record his/her response.

1. Did I make a pattern?

2. If yes, describe the pattern.

3. What is the core? (Illustrate by drawing or explaining.)

4. Does the core pattern repeat at least 2 times? How do you know?

5. If you answered "no" to question 1, what would make it a pattern?

Interviewer: \_\_\_\_\_

Interviewee: \_\_\_\_\_

## **All that Glitters..**

## **Student Resource #4**

For subscribing to cable, you qualified for a free gift. It is an imitation diamond and ruby bracelet. A jeweler in Baltimore was to make the bracelets. He put in the rubies first. He made one bracelet and used 3 rubies. When he had finished two bracelets, he had used 5 rubies. "Whew!", he said. How many rubies will I have used after making 12 bracelets? 14? 20?

Organize the data. Record the next four entries. Look for patterns. What decisions can you make about what you observe? Use mathematical terms to explain your work.

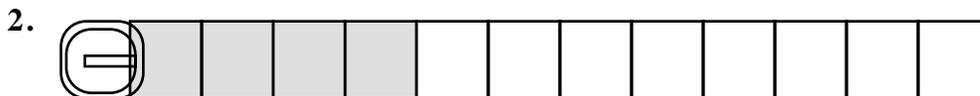
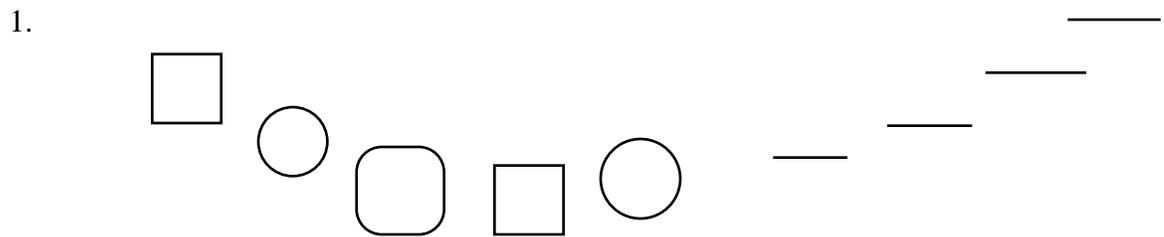
## All That Glitters.. Student Resource #5

### Problem #1:

Your class is having difficulty deciding what to make for display at the school fair. You remember the imitation diamond and ruby bracelet you received from the cable company as a free gift and suggested that the class make jewelry. You thought it would be interesting to try to design and make your own. A number of questions came to mind - how many pieces to make, what to make, how it would look and what would be needed.

You recall your work with patterns and think maybe this knowledge would help you solve some of your problems. Your class separates into groups. One group is in charge of designing the jewelry. Some ideas were submitted for consideration. Only a partial design or written description was given. You must continue the pattern or build one to see what it will look like.

Continue the following patterns:



3.

This suggestion was submitted:

A bracelet of 16 beads

Made of 3 colors

There are twice as many reds as any other color

No yellow is next to a red

Make your bracelet here.



**Problem #2:**

Another committee was responsible for decorating. A suggestion was made to make necklaces and bracelets of cubes, glue them together, then paint decals on all the sides. If the jewelry was made of one cube, there would be 5 sides to paint. Determine the number of sides you'll have to paint if the jewelry was made of 10 cubes. Organize and illustrate your results.

On a necklace or bracelet of 10 cubes there would be \_\_\_\_\_ sides to paint.

Write the rule for determining the number of sides.

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**Problem #3:**

The arrangement committee must determine how many different combinations of small beads can be placed on pins. If they choose two colors using two beads, they would be able to make four different combinations - blue red, red blue, red red, and blue blue (the position matters).

How many different combinations could be made if you used three beads? 4 beads? up to 10 beads? Show all work. Explain your thinking. Remember to use math language. Convince someone on another committee that you know what you're talking about ! Prepare a report about your findings.

### **RUBRIC FOR PROBLEM #1**

#### **3 Points**

Identified the pattern core.  
Repeated the core at least once.  
Used math vocabulary.

#### **2 Points**

Identified the pattern core.  
Repeated the core at least once.

#### **1 Point**

Identified the pattern core, but did not repeat it.

#### **0 Points**

Did not identify the pattern core.  
Did not use math terms.

### **RUBRIC FOR PROBLEM #2**

#### **3 Points**

Illustration of what the necklace would look like if it had ten cubes.  
Number of sides need to be painted (40 for 10 cubes).  
Use of math language on terms.  
Use of a table.  
Writing of the rule that determines the number of sides.

#### **2 Points**

Illustrates necklace with ten cubes.  
States the number of sides needed to be painted.  
Uses math language.  
Writes the rule.

#### **1 Point**

Illustrates necklace with ten cubes.  
States number of sides needed to be painted.

#### **0 Points**

Illustrates necklace with ten cubes.

## RUBRIC FOR PROBLEM #3

### 3 Points

Uses math language.  
Combinations of eight or more patterns.  
Explains thinking with evidence.  
Uses a table to help develop the rule.  
States reasons why pattern is correct.  
Illustrates work.

### 2 Points

Uses math language.  
Combinations of eight patterns or more.  
Uses a table to develop rule.  
Illustrates work.

### 1 Point

Combination of eight or more patterns.  
Illustrates work.  
Uses math language.

### 0 Points

Less than eight combinations.  
Uses math language.